

Technical Specification 021

LOW PRESSURE SEWER SYSTEMS AND GRINDER PUMPS

1.0 General

- a) Gravity sewer systems are the preferred alternative for service to Brunswick County residential and commercial customers. Some situations require the use of alternative sewer systems such as vacuum systems or low-pressure sewer systems utilizing grinder pumps.
- b) It is the intent of this specification to provide technical guidance and information concerning the design and installation of low-pressure sewer systems and grinder pumps that are permitted and installed in Brunswick County's Public Utilities' service area.
- c) The design engineer shall be familiar with all NCDEQ / DWQ rules and minimum design criteria for low pressure sewer systems and grinder pumps.
- d) Refer to the design section -- Part E -- of this Design Manual for detailed design guidance for low pressure sewer systems utilizing grinder pumps.

2.0 Low Pressure Sewer System Main and Service Lateral Materials

- a) Low pressure sewer system mains shall be:
 - 1) PVC pipe manufactured in accordance with ASTM D1785, ASTM D2241, ASTM D2672, or AWWA C900 as follows:
 - Pipes (2) – (4) inches diameter: minimum SDR-21
 - Pipes larger than (4) inch diameter: minimum DR-18
 - Pipes less than (2) inch diameter: SDR-21 and /or Schedule 40 PVC
 - All low-pressure sewer main piping installed in NCDOT rights-of-way shall be minimum DR-18
 - 2) DIP manufactured in accordance with AWWA C150 and 151 with pressure Class 350 (only with express written approval from county Public Utilities or Engineering Department)
 - 3) HDPE pipe manufactured in accordance with ASTM D2239, D3035, or AWWA C901.
 - 4) Fusible PVC pipe manufactured in accordance with AWWA C900 with ASTM cell classification 12454.
 - 5) ABS pressure pipe is prohibited for low pressure sewer systems in Brunswick County.

- b) All low-pressure sewer pipes shall be marked with diameter, manufacturer's name or trademark, pressure pipe type, grade and class, and shall be clearly visible for inspection purposes.
- c) All piping shall be installed in accordance with force main piping requirements per Brunswick County Technical Specification TS 022: Waste Water Force Mains and all NCDEQ / DWQ guidance document requirements.
- d) The sewer mains shall be located, to the maximum extent possible, in areas where damage is less likely and disruption to the neighborhood is minimized.
- e) Low pressure sewer system mains installation and testing:
 - 1) Install low pressure sewer pipe with a minimum cover depth of thirty-six (36) inches, unless approved in writing by Brunswick County. Limit trench widths to disturb as little undisturbed soil as possible. Trench backfill beneath pavement should be compacted in nine-inch lifts.
 - 2) Provide thrust restraint as required at all bends greater than (22.5) degrees and all tees, wyes, stops, valves or changes in pipe size, or per written approval of plans. Concrete thrust blocking and restrained joints are acceptable forms of thrust restraint per county standard details.
 - 3) Prior to commencement of pressure and leakage tests, all piping shall be pigged or flushed at minimum of (2.5) feet per second velocity to result in at least a 100% turnover of the water in the pipeline.
 - 4) All piping shall be tested to (150) percent of the maximum operating pressure – (100) psig minimum - for a period not less than (2) hours and shall be witnessed by the design engineer and county staff.
 - 5) For water main crossings refer to Brunswick County's Water and Sewer Crossings Standard Details and comply with all DEQ / PWSS / DWQ / NCAC rules on water and sewer main crossings.
- f) Low pressure sewer service laterals shall be:
 - 1) (1.5) inch for residential, or (2.0) inch for commercial, AWWA C901, SDR-9, polyethylene (PE) CTS, with a minimum pressure rating of (200) psi.
 - 2) Service taps and laterals shall consist of the tapping saddle and valve, service line tubing, and the service box. No joints are permitted in the service lateral from the main to the service box. The service box shall be located in non-traffic areas. Driveways shall not be formed around service boxes and the nearest distance from the service box to the driveway shall be no less than eighteen (18) inches. Service boxes shall contain an isolation plug valve and check valve with the isolation valve installed between the main and the check valve to allow for check valve replacement. The lid of the service box shall be marked SEWER and the lid painted green.

- 3) Refer to county low pressure system standard details for more information.
- g) Push on joints shall be:
 - 1) A single elastomeric gasket type with a pressure rating not less than the pipe pressure rating and meeting the performance requirements of ASTM D3139.
- h) Restrained joints (RJ) shall be:
 - 1) Required where indicated on the approved drawings.
 - 2) DIP: the restrained joint system shall have a pressure rating equal to or greater than that of the pipe on which it is used; push – on type joints shall be a standard manufacturer’s RJ system such as Snap-Lock (Griffin Pipe), T R Flex (U.S. Pipe), Clow Super Lock, or written approved equal; mechanical type joints shall be Meg-A-Lug (EBAA Iron), Cam-Lock, Sigma Corporation, or written approved equal.
 - 3) PVC: the restrained joint system shall have a pressure rating equal to or greater than that of the pipe on which it is used; push – on type joints shall be a standard manufacturer’s RJ system such as Snap-Lock (Griffin Pipe), T R Flex (U.S. Pipe), Clow Super Lock, or written approved equal; mechanical type joints shall be Meg-A-Lug (EBAA Iron), Cam-Lock, Sigma Corporation, or written approved equal.
 - 4) All retainer gland type RJ shall be Meg-A-Lug (EBAA Iron), Cam-Lock, Sigma Corporation, or written approved equal.
 - 5) PVC and/or DIP to IPS pipe: deep bell, ductile iron, with knuckle restraint, as manufactured by Sigma, HARCO, or written approved equal.
- i) Vent pipe (if required for floodplain applications) shall be:
 - 1) (2) inch, Schedule 80 PVC, vented through the side wall of the grinder tank, and shall replace the standard top mounted mushroom vent, and the vent pipe opening shall be screened and terminate a minimum of (2) feet above the (100) year flood elevation or as directed by the Engineer.
- j) Fittings shall be:
 - 1) Fittings for PVC pipe three (3) inches and smaller: deep bell, ductile iron, with knuckle restraint, as manufactured by Sigma, HARCO, or written approved equal. Glue joint fittings are also acceptable for PVC pipe three (3) inches and smaller.
 - 2) Fittings for PVC pipe four (4) inches and larger: AWWA C115, ductile iron shall have a ceramic epoxy Protecto 401, Ceramapure PL90, lining, or written approved equal, with the exterior coated with coal tar epoxy or other

bituminous coating to resist ground corrosion, as manufactured by Sigma, HARCO, or written approved equal.

k) Air Release Facilities:

- 1) Air release facilities shall be similar to that specified in the Brunswick County Technical Specification TS 022: Wastewater Force Mains. Air release facilities shall be located at summits of all pressure sewer systems and properly sized to prevent buildup of air or gases.
- 2) All air releases shall be automatic type. Manual air releases are not permitted. Comply with all NCDEQ / DWQ / NCAC rules on locations of air release valves.
- 3) Boxes and vaults for air release facilities, cleanouts and other appurtenances shall be sized to permit easy removal of the facilities and permit operations of the valves. "Sewer" shall be clearly marked on the box or vault cover. per county standard details.

l) Locating wire and marker balls:

- 1) All low-pressure sewer main piping shall have a #12 AWG, high strength copper clad steel conductor (HS-CCS) such as Copperhead Superflex, Pro Trace High Flex, or written approved equal, with HDPE insulation, and rated for direct burial. Listed and written approved underground connectors shall be used for all splices. The wire shall be brought up into a valve box at (1,000) feet maximum intervals to provide wire access points. The wire shall be taped to the top of the low-pressure sewer main at minimum ten (10) foot intervals.

The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the installation with County staff present.

- 2) In addition to the tracing wire, electronic marker balls may be required on the low-pressure sewer main. Refer to Brunswick County Technical Specification TS 035: Electronic Markers for Water and Sewer Pressure Mains for technical and installation requirements.

m) Low pressure connection to existing county sewer system:

- 1) All low-pressure connections to gravity sewer systems shall be made at a manhole and enter at the existing invert to minimize turbulence of flow and the release of hydrogen sulfide gas. If the low-pressure sewer main cannot enter at the existing invert, then a restrained joint inside drop must be constructed per county standard details.
- 2) Where low-pressure sewer mains connect to an existing gravity sewer manhole, the manhole shall be polymer concrete or plastic polypropylene to protect against hydrogen sulfide corrosion per Brunswick County Technical Specification TS 020: Gravity Sanitary Sewer Systems – Section

5.0 (c) (11). If the existing manhole is concrete, either it shall be replaced by a plastic polypropylene or precast polymer concrete manhole, or a transitioning manhole made of polymer concrete or polypropylene shall be added. If a transitioning manhole is installed, the distance between the existing manhole and the transitioning manhole shall be no less than thirty-six (36) inches unless otherwise approved in writing by county staff. Where pressurized sewer mains connect to a gravity sewer manhole, the inside diameter of the manhole shall be four (4) feet minimum.

- 3) For new low-pressure sewer mains connecting to an existing county gravity system that requires the cut in of a new manhole:

The new sewer manhole shall be plastic polypropylene or precast polymer concrete sections conforming to applicable standards outlined in Brunswick County Technical Specification 020: Gravity Sanitary Sewer System Section 5, and ASTM C478, as manufactured by Nyloplast ® ADS, Armorock, Meyer Polycrrete, or written approved equal. Riser section joints shall be bell and spigot / ship-lap design seamed with butyl mastic and/or rubber gaskets (ASTM C 990) so that on assembly the manhole base, riser(s), and top sections make a continuous and uniform manhole structure.

A carbon filter must be provided on any manhole that has a low-pressure sewer system connection.

- n) In-line cleanouts and shutoff valves:

- 1) In-line cleanouts and shutoff valves shall be provided on low pressure sewer main lines per county standard detail.
- 2) Spacing of cleanouts and shutoff valves shall not be less than six hundred (600) feet of main line in high density areas and not less than one-thousand (1,000) feet in low density areas.
- 3) Cleanouts shall be provided on the upstream side of all directional drills with a vertical elevation change of ten (10) feet or greater.
- 4) In-line isolation valves are required of both sides of all directional drills per county standard detail.

3.0 Packaged Grinder Pump Systems

- a) Simplex residential packaged low-pressure sewer grinder pumps shall be:
 - 1) Barnes OGP 2 HP, or written approved equal
- b) Commercial and industrial duplex pump stations shall typically be permitted in the owner's name and shall be operated and maintained by the owner. The design engineer shall model the system and select a pump with the appropriate discharge head conditions to operate satisfactorily under all operating conditions. Contact

county engineering staff for assistance with system modeling information and sewer system pressure data.

Per the county Grinder Pump Maintenance Program, duplex pump stations may be permitted in the county's name for operation and maintenance in limited applications. In these limited applications, the engineer shall use the Barnes OGP two (2) HP pump system, or written county approved equal, and shall verify its adequacy for the design flow and discharge head conditions. A duplex grinder pump station permitted in the county's name shall only serve one building. Any proposed pump station that requires a larger pump horsepower will not be accepted for county ownership and maintenance.

c) Packaged System Requirements

1) Wetwell:

Fiberglass, minimum storage of three hundred and sixty (360) gallons above the PUMP OFF level, (4) inch diameter PVC inlet flange for Schedule 40 PVC sanitary line, pump discharge brass adapter socket, easily adaptable to either (1.5) inch for residential, or (2) inch for commercial applications, PVC or HDPE pipe materials, aluminum lid, mushroom vent on tank lid, extended base, integral to the tank, for anchoring the anti-flotation concrete ballast to tank, contractor shall provide concrete ballast as required, wet well shall not be installed in the rear of the house or inside any fenced area, removal of pumps and / or operation of discharge valve shall not require personnel entry into the tank.

For floodplain applications: watertight lid, solid, no mushroom vent on lid, (2) inch NPT female hub shall be provided in place of the mushroom vent for installation by the contractor for side wall venting of the tank utilizing Schedule 80 PVC vent piping.

2) Pump and motor:

Vertical rotor, motor driven, solids handling type, double O-ring seal at all casting joints, pump castings cast iron, fully epoxy coated 8-10 mils nominal dry thickness, rotor shall be stainless steel, through-hardened, polished, maximum discharge pressure shall not exceed 150 psi, minimum 1.0 HP with 2.0 HP standard.

3) Electrical:

240 VAC, 60 Hz, single phase, 3450 RPM, pump cord length (15) feet minimum, UL and CSA listed, quick connect cord for watertight attachment to pump.

Note: Pumps will not operate on 208 VAC circuits and shall not be connected to 208 VAC circuits. Buildings with 208 VAC electrical systems shall require a 208 / 240 VAC transformer to provide the required 240 VAC.

4) Grinder:

Mounted directly below the pumping elements, direct-driven, fastened to the pump motor shaft by means of a threaded connection only, cutter teeth hardened to Rockwell 50-60 for abrasion resistance, solids must be fed in an upward flow direction.

5) Integral Check Valve:

Factory installed, gravity operated, flapper type integral check valve built into the stainless-steel discharge piping, must provide a full-ported passageway when open, working parts constructed of 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance.

6) Level Controls:

Starting controls to be located in the cast iron enclosure of the core unit – plastic enclosure for starting controls is not acceptable, provide float switch type level controls for PUMP OFF, PUMP ON, and HIGH LEVEL ALARM in the wet well for simplex grinder pump stations, provide float switch type level controls for PUMPS OFF, LEAD PUMP ON, LAG PUMP ON, and HIGH LEVEL ALARM for duplex grinder pump stations, pump on / off and high level alarm functions shall not be controlled by the same switch.

Float switches shall consist of a mercury tube switch sealed within a corrosion resistant polypropylene housing with a minimum (18) gauge, (2) wires, SJOW / A jacketed cable. The cable shall be of sufficient length to reach the connection junction box without splicing. The floats shall be suspended from a stainless-steel support bracket mounted inside the wet well such that any adjustment or replacement may be done without entering the tank. Float level controls shall be UL / CSA listed and approved.

7) Power and Control Cables:

The power and control cables shall be a minimum of (25) feet long or as needed to connect the wet well to the pump control panel. The power and control cables shall not be spliced between the wet well and pump control panel. The cables shall be UL / CSA listed and approved. The power and control cables shall be installed in minimum (1.5) inch PVC conduit (simplex pump) and minimum (2.0) inch PVC conduit (duplex pumps). The conduit ends shall be sealed at each end with non-hardening duct sealant.

At the discretion of Brunswick County Public Utilities a direct burial rated power and control cable assembly may be utilized. Any direct burial cable assembly shall be UL / CSA listed and approved.

Connection of power and control cables at the wet well shall be a sealed watertight connection. Power cable shall be sealed at the motor and

clamped in place with a rubber watertight seal bushing to seal the outer jacket against leakage and to provide for strain relief. Cables shall withstand a pull of 300-pound force.

8) Control Panel:

Automatic control panel, NEMA 4X rated, UV resistant, UL listed for wall or pole mounting, hinged, lockable cover, high level alarm with red lexan (polycarbonate) alarm light and alarm horn, must be mounted so the alarm light is visible from the street, control panel must be within line-of-sight of the wet well, a placard shall be affixed to the control panel with the Brunswick County Public Utilities emergency phone number on the placard for the owner's use and a 2nd copy of the placard placed inside the panel.

All internal wiring to be neat and color coded. A schematic wiring diagram shall be permanently affixed to the inside of the panel door. An installation and service manual for each control panel shall be provided Brunswick County Public Utilities.

All conduits shall enter the bottom of the control panel and utilize a watertight hub – Myers or written approved equal.

9) Local Disconnects:

Simplex Pump local disconnect: Single family residential grinder pumps are required to have the pump alarm and control circuit powered independently of the pump power circuit. Therefore, two local disconnects are required adjacent to the grinder pump control panel:

Pump Alarm & Control Circuit: 120 VAC, single phase, (15) amperes,
single pole disconnect

Pump Power Circuit: 240 VAC, single phase, (30) amperes, double
pole disconnect

Disconnects shall be UL listed and rated for outdoor applications and installed per all NEC and Authority Having Jurisdiction (AHJ) requirements.

The disconnects are required on the homeowner's branch circuit supplying the grinder pump panel and shall be installed before county staff will energize the grinder pump system.

Duplex Pump local disconnect: 240 VAC, double pole, single phase, (60) ampere rated electrical disconnect is required adjacent to the grinder pump control panel. Disconnect to be UL listed and rated for outdoor applications and installed per all NEC and Authority Having Jurisdiction (AHJ) requirements.

This disconnect is required on the branch circuit supplying the duplex grinder pump panel and shall be installed before county staff will energize the grinder pump system.

10) Warranty:

Minimum (2) year parts and labor warranty on the complete station and accessories, including, but not limited to, the control panel, pump and motor assembly, and integral check valve.